Space Weather Forecast

Issued on Tuesday, 09 May 2023 at 13:27 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/G2 Minor/Moderate geomagnetic storm conditions expected late 10 into 11 May. S1/Minor Solar Radiation Storm ongoing. Further R1/R2 Minor/Moderate radio blackouts expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has remained Moderate over the past 24 hours, with several Moderate flares observed, all from the medium sized, but magnetically complex region in the northwest. The largest region, in the northern centre disc appeared largely inactive, although some minor development in the spots within the group has taken place. These sunspots are among ten currently on the disc. All others are small and/or simple regions at present.

A number of Coronal Mass Ejections (CMEs) were observed leaving the sun in the past 24 hours. Analysis of these features is complicated due to limited solar imagery and faint ejecta signatures in some cases. Overall, the majority if not all of the ejecta appears to be well-ahead or behind of Earth orbit, however, some Earth-directed component cannot be completely ruled out.

Solar Wind / Geomagnetic Activity: The solar wind was mainly indicative of a fast wind. This became less clear-cut later in the period and eased. The solar wind rose from elevated levels to reach a peak of around 550km, before moderating thereafter, becoming slightly elevated and close to background by the end of the period. The Interplanetary Magnetic Field (IMF) strength was largely weak with the important north-south component also varying weakly. Resultant geomagnetic activity was Quiet to Active (Kp1-4).

Energetic Particles / Solar Radiation: Solar radiation rose from background to cross the S1 Minor Solar Radiation Storm threshold very early in the period, rising to a peak of 38pfu at 09/0150UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Occasional Moderate activity is expected to continue, with further M-flares likely and a slight chance of isolated X-class flares.

Solar Wind / Geomagnetic Activity: A near-full halo CME was observed in imagery with the moderate-class flare at 07/2323UTC. Although much of the ejecta appears to be directed towards the northwest an Earth-directed component is expected and has been modelled to arrive at Earth either on late 10 or early 11 May. In addition to this, a further CME candidate is awaiting imagery.

Earth is otherwise currently in a fast wind regime.Slightly elevated winds should ease to background through the first 24 hours of the forecast. A minor resurgence in the solar wind may occur late on 11 May due to yet another 'coronal hole' fast wind. Any impacts are expected to be weak based on 27-day persistence, in any case most likely swamped by the concurrent arrival of the CME (detailed above).

On 09 May Quiet to Unsettled activity is expected, giving way to an expected G1-G2 (Minor to

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Moderate) storm, either late on 10 May or else early 11 May, with a chance of G3 (Strong) geomagnetic storm levels being reached. This risk should recede to a chance of G1 by 12 May given uncertainties in recent CMEs.

Energetic Particles / Solar Radiation: Solar radiation levels are likely to remain above the S1 threshold on 09 May but with a declining trend unless any response from the mid-high Moderate flare event from a sunspot in the northwest at 09/0354 UTC is observed. The chances of S1 being maintained after midweek should fall - in the absence of further significant flare activity.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	80	80	20
Strong	G3	No	1	20	20	1
Severe	G4	No	1	5	5	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	80	80
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	50	30	25
Very Active	≥ S3 *	No	5	3	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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